XY Table

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Introduction

This document describes the building of a small XY table for the PiLoupeX measuring microscope.

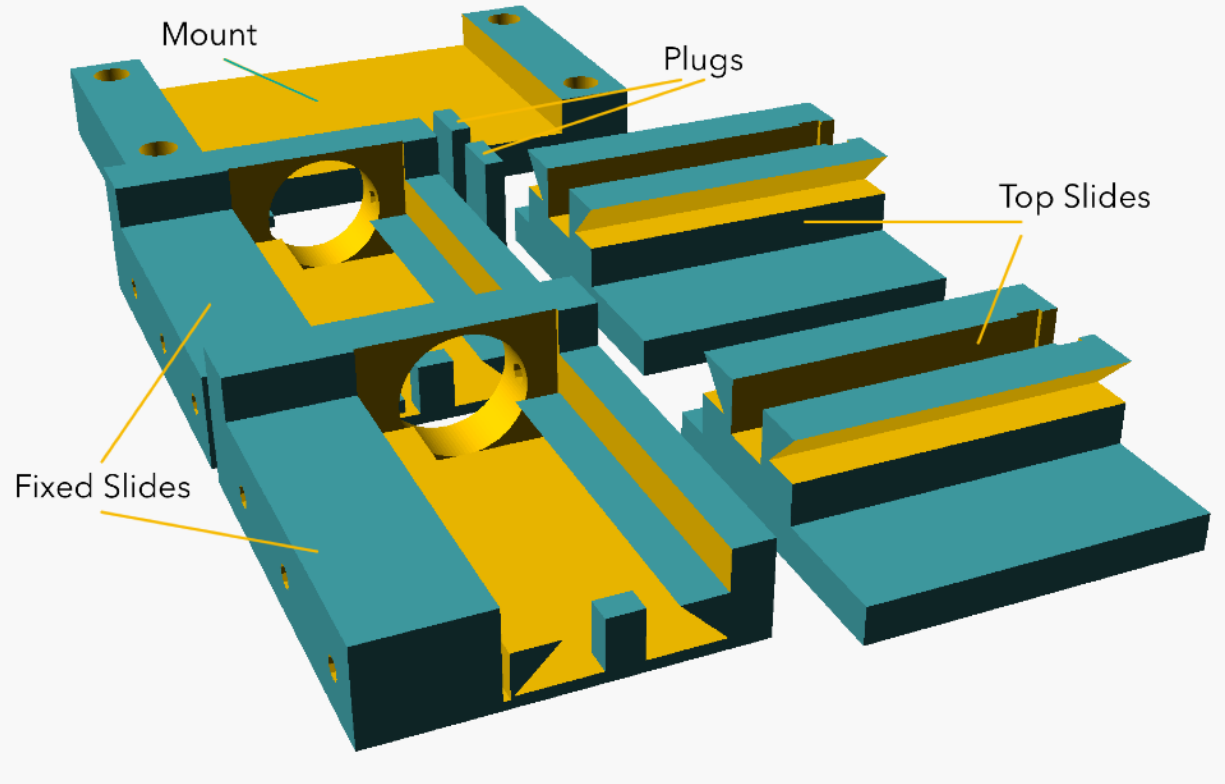
The main components are printed on a 3D printer using PLA filament. The 0-13mm range micrometer heads can be purchased from eBay and cost a bit less than £7 each. In addition there are seven 5mm long 3mm grub screws used of which six are optional, and two springs scavenged from click ballpoint pens.

The micrometers are graduated to 0.01mm but given all the vagaries of the construction an accuracy of +/- 0.01mm is probably more realistic which in English is better than a thousandths of an inch.

XY Table

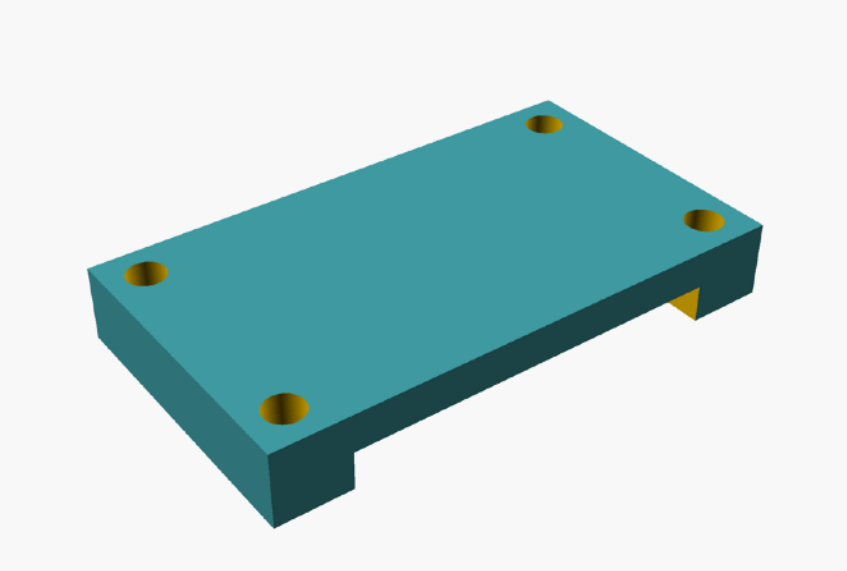
Printing

Shown below is a render of the plastic parts required for construction. The design employs traditional dovetail slides. The secret is to use the finest slices that the printer will allow. The orientation shown should print without any support material.



Mount

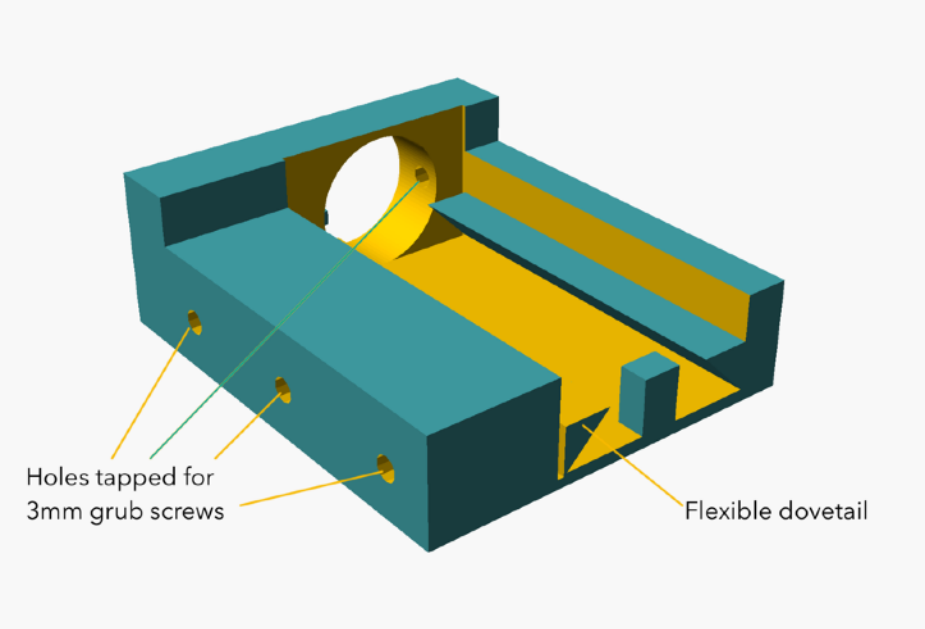
This is simply a base to allow the finished item to be screwed down.



XY Table

Fixed Slides

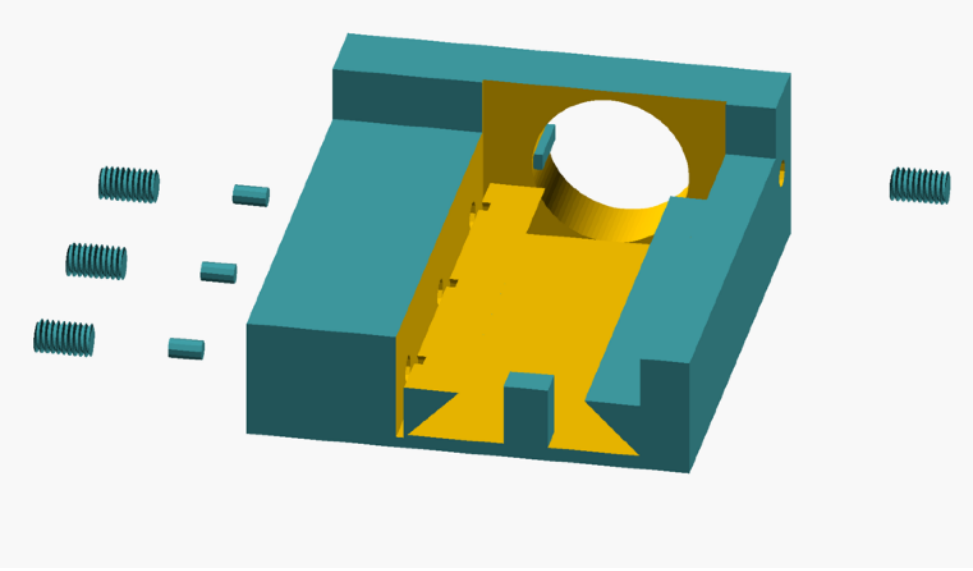
These hold the micrometers and have a flexible dovetail for adjustment of the sliding mechanism.



Here the fixed slide is shown with its grub screws and plugs.

The three grub screws on the left move the adjustable dovetail which bears on the top slide dovetail and tightens the sliding mechanism. The plugs are simply bits of PLA (1.75mm) filament. These are used so that the holes need only be tapped to half depth.

The grub screw on the right holds the micrometer in place and is tapped right through

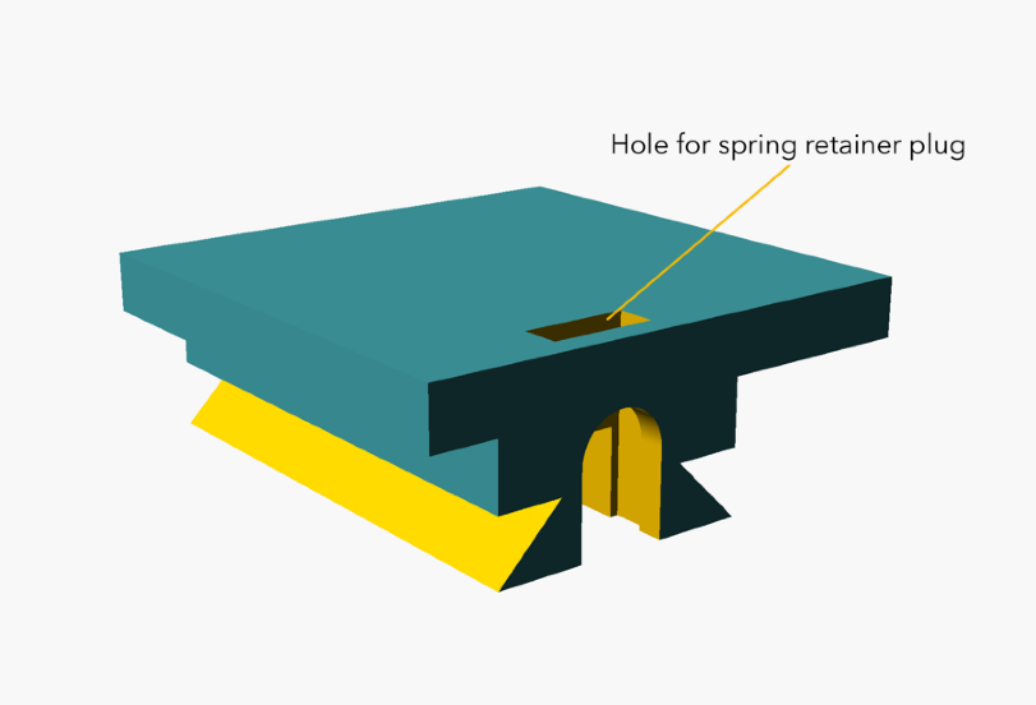


XY Table

Top Slides

These are the bits that move when the micrometers are adjusted.

A printed spring retaining plug is pushed through the hole in the top slide during construction.



Construction

Once the components are printed the fit of the micrometers should be checked. The 14mm hole will probably need a bit of cleaning up.

Now the slides can be checked for fit. If they don't slide together check for bits of spurious plastic and remove them. If they slide together completely then they should become super smooth after a coat of PTFE spray. This is magic stuff as it fills in the undulations in the plastic and leaves a coating of PTFE. Only spray the sliding surfaces as other surfaces will later be glued.

XY Table

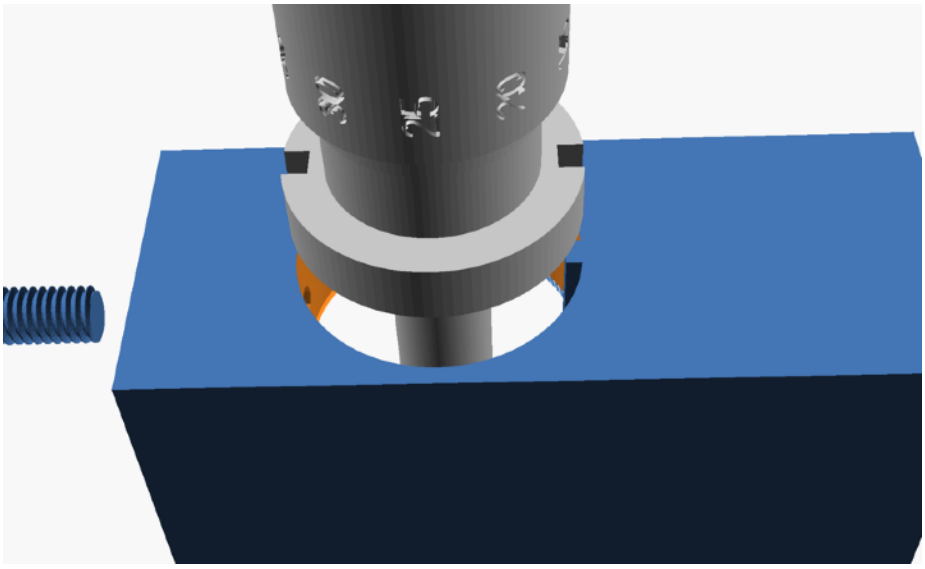
Now the springs can be fitted. I used ballpoint pen springs which had to be stretched a bit to ensure sufficient travel. This is a bit fiddly but the aim is to keep the table under tension once the spring retaining plug is in place. The plugs, as printed, will most likely need a bit of filing but should remain a good friction fit.

As the X and Y slides need to operate in tandem they must be stuck together at right-angles to each other. I was planning to use superglue but in the end used thin double sided tape which proved perfect for the job and offered the opportunity of disassembly should mistakes be made. Consider the final orientation of the micrometers when sticking the two slides together.

Now the slide assembly can be stuck to the base. Consider access to the mount's screw holes when completing this step. Fix the slide assembly off centre to satisfy this.

XY Table

Finally the micrometers can be attached. The design accommodates a notched mounting ring that came with the micrometers. There is a location point at one side of the mounting hole. The other notch accepts the grub screw.



Adjustments

As stated before the adjustment grub screws are optional but do make the table less prone to sideways deflection.

Cut some pieces of PLA filament about 4mm long and drop them in the three adjustment holes on the fixed slides. Now insert the grub screws and wind them in until resistance is felt. Whilst moving the top slide back and forth tighten the grub screws one at a time until the slide starts to bind, then back off ensuring the it continues to move freely with the return spring.
The return spring stiffness and lengths will tend to govern the optimum travel of the table, but if this centres on the half way point (6.5mm) it should prove satisfactory.

